# METHOD OF MANUFACTURING CARDS COMPRISING AT LEAST ONE ELECTRONIC MODULE, ASSEMBLY PRODUCED DURING THIS METHOD AND INTERMEDIATE PRODUCTS

**[0001]** This is a National Phase Application in the United States of International Patent Application No. PCT/EP2007/055530 filed Jun. 5, 2007, which claims priority on European Patent Application No. 06012550.7, filed Jun. 19, 2006 and International Patent Application PCT/EP2006/008552, filed Oct. 5, 2006. The entire disclosures of the above patent applications are hereby incorporated by reference.

## FIELD OF THE INVENTION

**[0002]** The present invention concerns a method of manufacturing cards that each include an electronic module, in particular, an electronic module comprising an electronic display. The card obtained from the method according to the invention is, for example, a bankcard, in particular, which conforms to the ISO standard. However, the present invention can also apply to electronic cards whose general profile is not rectangular, particularly circular cards. The present invention also concerns assemblies and intermediate products obtained within the scope of the method according to the invention.

## BACKGROUND OF THE INVENTION

**[0003]** Electronic cards or integrated circuit cards have considerably developed over the last few years. Initially, electronic cards were formed of a card body including a resistive contact module housed in a recess in the body of the card. Then, contactless cards were made, i.e. cards including a transponder formed of an electronic circuit connected to an antenna. As electronic cards develop, it is sought to integrate other electronic elements for other functions into the cards. By way of example, cards including a switch that can be activated by the user and an electronic display have been disclosed. Such cards generally require relatively large batteries or powering means of the photovoltaic cell type. In order to integrate these various elements in a card, they are generally grouped together in the form of at least one electronic module, including a support or substrate, on the surface of which various electronic elements are arranged. FIG. **1** shows a schematic example of this type of module. Module **2** includes an integrated circuit **4**, connected to an electronic display **6**, a battery **8** and an activator **10**, arranged on a support **12**, forming a PCB interconnecting these various elements. In order to limit the thickness of these modules, the battery and/or the display can be arranged at the periphery of support **12** or in recesses therein.

**[0004]** It is not easy to integrate a relatively large electronic module, made up of various elements of variable shape and size, in a card. Further, integrating a digital display, which has to be precisely positioned in the manufactured card, causes an additional problem, which the present invention proposes to overcome.

**[0005]** EP Patent No. 0 570 784 discloses, in one implementation, a method of manufacturing cards including an electronic assembly, in particular, a transponder, which is placed in a main aperture of a positioning frame. According to the implementation disclosed, the transponder and the positioning frame are embedded in a binding agent that can be added in viscous liquid form, particularly a resin. In EP Patent No. 0 570 784, the positioning frame is only used for delimiting an inner zone for the transponder, formed of an integrated circuit and a coil, inside the card. Thus, when pressure is applied to the various elements and the binding agent to form a card, the transponder is held in an inner zone, whereas it is possible for the binding agent, in a non-solid state, to spread out on to form a layer that passes through the manufactured card. Those skilled in the art can find, in this Patent document, a method for integrating a relatively large and complex-shaped electronic module in a compact, flat card. However, the electronic module placed in the main aperture of a positioning frame, as described in that document, will often be moved slightly when the card is being formed. Indeed, this document does not disclose how to maintain the transponder in a precise, determined position inside the aperture of the positioning frame. Those skilled in the art might certainly think of reducing the dimensions of the main aperture to make them approximately match the dimensions of the electronic module, in particular the external profile of the module. However, manufacturing tolerances must be taken into account, so that it is difficult to envisage too tight a fit. Moreover, depending upon the way in which the modules are manufactured, the positioning of the various elements on the support may also vary slightly. Thus, for example, digital display **6** is arranged on the surface of the PCB or at the periphery thereof in a position that may vary slightly. However, to obtain a high quality card, this digital display must be positioned precisely relative to the external contour of the manufactured card. This is particular important when a transparent aperture, which fits the dimensions of the digital display, is arranged above the digital display to allow the user of the card to read the display.

**[0006]** There is a further problem in addition to this problem of positioning the electronic module relative to the external contour of the card. This problem concerns introducing the electronic module within the card manufacturing installation. It will be noted here that electronic cards are generally manufactured in batches, i.e. several cards are manufactured simultaneously in the form of a plate that includes a plurality of electronic modules. Then, each card is separated from the obtained plate during a cutting step, as is described in EP Patent No. 0 570 784. Within the scope of the embodiments described in the latter disclosure, the transponder remains free in relation to the positioning frame until the card is formed. This requires precautions in the handling of the various elements brought to form the card, to ensure that the transponders remain in the corresponding apertures in the positioning structure until the press is activated.

**[0007]** The present invention thus also proposes to answer this latter problem, in order to simplify the provision of electronic modules, while ensuring that the electronic modules are held in the apertures of a positioning structure and to facilitate assembly of the various elements and materials provided for manufacturing the cards.

**[0008]** Therefore, the present invention concerns, firstly, an assembly produced during the manufacture of cards, which each include an electronic module. The card manufacturing process includes the provision of a plate, which has at least one, at least partially through aperture, and at least one electronic module, which is electrically independent of said plate and housed, at least partially, in said at least one aperture, in an installation where a resin is added to at least one side of said electronic module, said plate forming a positioning struc-